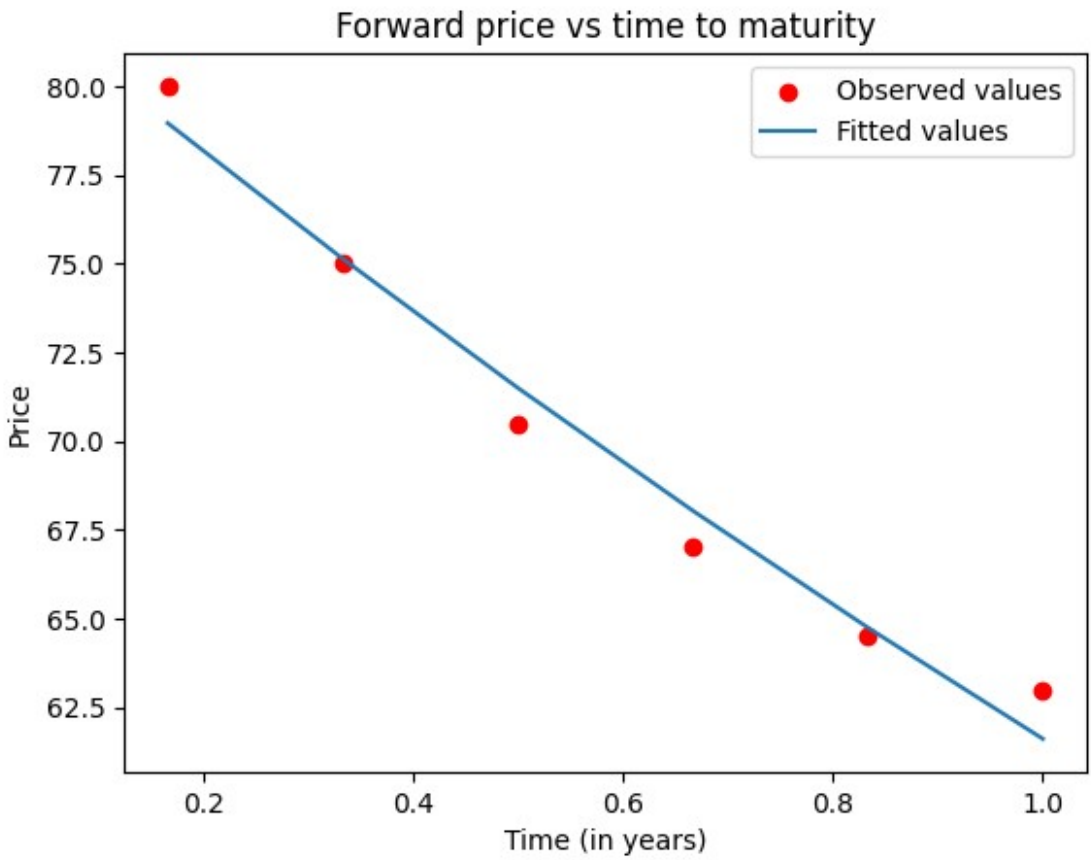
```
from matplotlib import pyplot as plt
import numpy as np
from scipy.optimize import minimize

Ftvec = np.array([80, 75, 70.5, 67, 64.5, 63])
T = np.array([1/6, 2/6, 3/6, 4/6, 5/6, 6/6])
r = 0.05

def compute_error(pmt):
    S0, delta = pmt
    v1 = S0 * np.exp((r-delta)*T)
    sse = (Ftvec-v1)@(Ftvec-v1)
    return sse

output = minimize(compute_error, [88, 0.11])
S0_final, delta_final = output["x"]

print("S0:", S0_final)
print("delta:", delta_final, "=", np.round(delta_final*100, 2), "%")
```

```
S0: 82.97307060124456
delta: 0.3476824593023124 = 34.77 %
```

```
plt.scatter(T, Ftvec, label = "Observed values", c = "red")
plt.plot(T, S0_final * np.exp((r-delta_final)*T), label = "Fitted
values")
plt.legend()
plt.xlabel("Time (in years)")
plt.ylabel("Price")
plt.title("Forward price vs time to maturity")
plt.show()
```


Forward price vs time to maturity
Observed values
Fitted values
80.0
77.5
75.0
72.5
70.0
67.5
65.0
62.5
Price
0.2
0.4
0.6
0.8
1.0
Time (in years)